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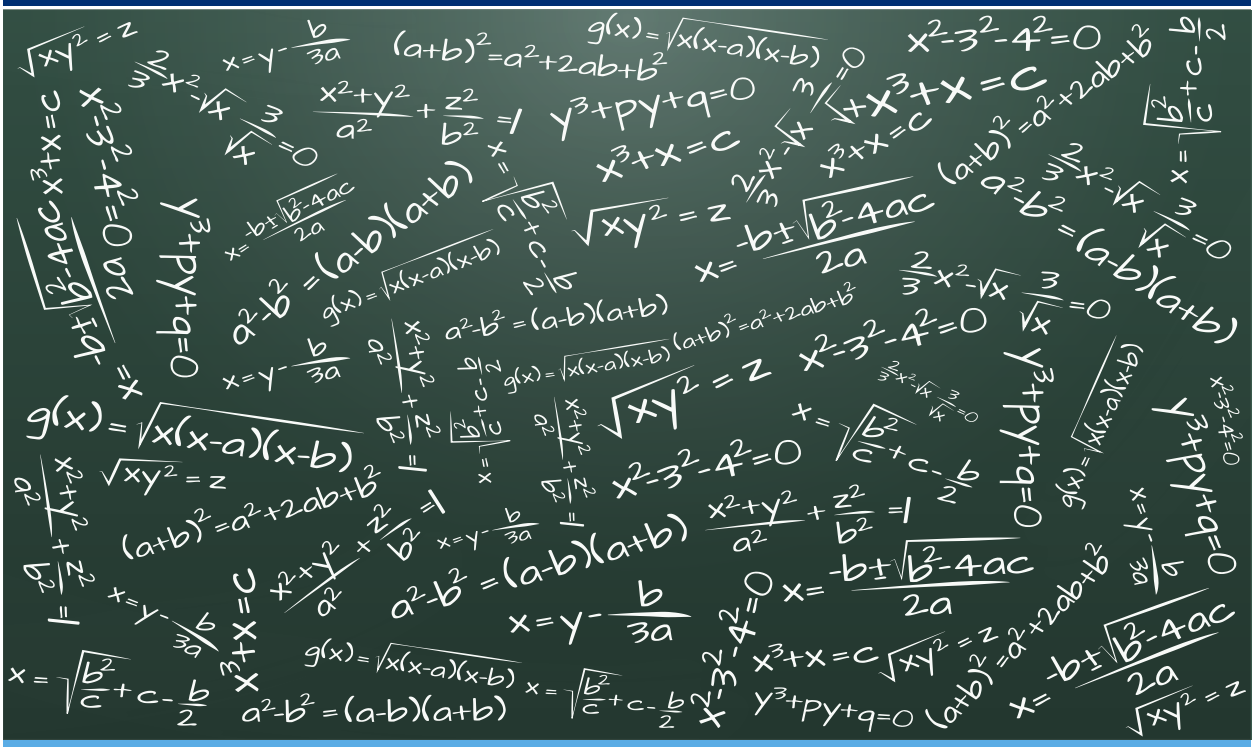

POLICY BRIEF

Reducing the Achievement Gap: An empirical analysis of middle school math performance in six states and Washington, D.C.

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Over the past thirty years, numerous federal policies have focused on the goal of closing the achievement gap in the United States. For example, the reauthorization of the Elementary and Secondary Education Act (ESEA) under the Bush Administration as No Child Left Behind (NCLB) helped to highlight inequalities between subgroups and provided suggestions on how to address these inequalities.[1] Under the Obama Administration, the reauthorization of the ESEA as the Every Student Succeeds Act (ESSA) provided states with various options for helping close learning opportunity gaps for struggling students.[2]

There are different ways to define achievement gap. One commonly used definition refers to the racial achievement gap, which is the difference between the percentage of white students and the percentage of a different ethnic group of students—such as African Americans—who achieve proficiency on a state exam. A similar definition relates to the income achievement gap, by which the gap refers to the differences in achievement between low-income students and higher-income students. In this paper, we use a different definition. We define the achievement gap as the percentage of students who do not reach academic proficiency at each grade level. This is an important measure of the achievement gap, because it identifies how many students are on track for college- and career-readiness by the end of high school – and how many are not.

Performing below grade level is a problem for students from all backgrounds, but some student groups are more likely to perform much more below grade level than others. In particular, Hispanic students, African American students, and low-income students historically perform worse than other student groups. Individual states have tried to encourage success for students across the board; however, achievement gaps have persisted.

The National Assessment of Educational Progress (NAEP) is the standard by

1 Sean F. Reardon et al., "Left behind? The Effect of No Child Left Behind on Academic Achievement Gaps" (Stanford, CA: Stanford Center for Education Policy Analysis, August 2013), https://cepa.stanford.edu/sites/default/files/reardon%20et%20al%20nclb%20gaps%20paper%2012aug2013.pdf.

2 "Closing Early Learning Opportunity Gaps Under ESSA," National Council of State Legislatures, October 10, 2018, http://www.ncsl.org/research/education/equity-and-the-opportunity-gap.aspx.11,26]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}

which the United States assesses student performance and achievement in various academic subjects in Grades 4, 8, and 12. In 2017, 34% of 8th-grade math test-takers scored at or above the proficient level on the NAEP, while 36% scored at the basic level, and 30% were below basic.[3] Progress for all groupshas stalled, and the gaps between white and African American students, and between white and Hispanic students, have remained largely unchanged since 1990. The gap between students at high-poverty and low-poverty schools has likewise remained relatively unchanged since 2005.

This report brings additional insight and perspective on achievement gap closure (i.e., elimination) and reduction by searching across six states and Washington, D.C., to quantify the number of schools that have been particularly successful at closing or reducing the achievement gap in middle school mathematics. This analysis focuses on achievement gap reduction within schools, both across the entire student body and among student subgroups, including African American, Hispanic, and low-income students. We find that while some schools have shown large and consistent progress towards achieving proficiency for all of their students, they are remarkably rare, and no school has successfully closed the achievement gap entirely.

Why the gap?

There are many potential factors that might explain why the achievement gap persists. These potential factors could be specific to individual students, they may be relevant to different classrooms, or they might exist as school-level differences.[4,5,6] At the individual student level, the achievement gap relates to such variables as family socioeconomic status, low motivation, poor attendance, behavioral factors, or even predictors related to student health. At the classroom level, potential explanations include low-quality curricula or being surrounded by low-achieving peers. Finally, at the school level, factors that may worsen the achievement gap include a lack of effective instructors and inequitable access to high-level mathematics coursework. When examining the achievement gap more closely, the largest gaps exist for underrepresented minority students[7] and students from low-income

3 "NAEP Mathematics: National Achievement-Level Results," accessed November 14, 2018, https://www.nationsreportcard.gov/math_2017/nation/achievement?grade=8

4 Robert Balfanz and Vaughan Byrnes, "Closing the Mathematics Achievement Gap in High-Poverty Middle Schools: Enablers and Constraints," *Journal of Education for Students Placed at Risk (JESPAR)* 11, no. 2 (April 2006): 143–59, https://doi.org/10.1207/s15327671espr1102_2.

5 Charles E. Basch, "Healthier Students Are Better Learners: A Missing Link in School Reforms to Close the Achievement Gap," Journal of School Health 81, no. 10 (October 1, 2011): 593–98, https://doi.org/10.1111/j.1746-1561.2011.00632.x.

6 Sean Reardon, "The Widening Academic Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations," in Whither Opportunity?: Rising Inequality, Schools, and Children's Life Chances, ed. Greg J Duncan and Richard J Murnane, 2011.

7 Underrepresented minorities are traditionally defined as African-American, Hispanic, and Native-American students. National Science Foundation, "Broadening Paticipation at the National Science Foundation: A Framework for Action" (Arlington, VA: Author, 2008).

households. Relating very closely to the racial achievement gap, behavioral factors such as suspension and expulsion are particularly predictive of underachievement.[8] More specifically, underrepresented minority students are disproportionately suspended or expelled from school in comparison to their white peers. Missing school for any reason can have detrimental effects on achievement, and suspension or expulsion from school increases the number of days students are absent from school.

One other potential explanation for this growing gap in the middle grades for disadvantaged groups could be the disconnect between the broad reforms calling for more stringent graduation requirements, higher stakes testing and improved standards, and the specific reforms associated with allocating resources for interventions to address these new higher standards.[9] Increasingly, low-income or high-minority schools implement broad, national reforms such as NCLB or ESSA, but not specific reforms such as increased tutoring or extended learning opportunities. Interestingly, public opinion surrounding the achievement gap differs along racial and socioeconomic lines: people in the United States express more concern about addressing the socioeconomic gap than any ethnicity-based gaps.[10]

Potential strategies for gap closure

Under ESSA, there are four categorizations, or "tiers," for evidence-based interventions.[11]

- Tier 1, "Strong Evidence," identifies programs supported by results from randomized experimental studies.
- Tier 2, "Moderate Evidence," identifies programs supported by results from quasi-experimental studies.
- Tier 3, "Promising Evidence," refers to programs supported by corelational studies.
- Tier 4, "Demonstrates a Rationale," identifies programs supported by

8 Anne Gregory, Russell J. Skiba, and Pedro A. Noguera, "The Achievement Gap and the Discipline Gap: Two Sides of the Same Coin?," *Educational Researcher* 39, no. 1 (January 1, 2010): 59–68, https://doi.org/10.3102/0013189X09357621.

9 Robert Balfanz, Allen Ruby, and Douglas Mac Iver, "Essential Components and Next Steps for Comprehensive Whole‐School Reform in High Poverty Middle Schools," *Yearbook of the National Society for the Study of Education* 101, no. 2 (June 1, 2002): 128–47, https://doi.org/10.1111/j.1744-7984.2002.tb00079.x.

10 Jon Valant and Daniel A. Newark, "The Politics of Achievement Gaps: U.S. Public Opinion on Race-Based and Wealth-Based Differences in Test Scores," *Educational Researcher* 45, no. 6 (August 1, 2016): 331–46, https://doi.org/10.3102/0013189X16658447.\\uc0\\u8221{} {\\i{}Educational Researcher} 45, no. 6 (August 1, 2016

11 "Evidence-Based Interventions Under the ESSA - Every Student Succeeds Act (CA Dept of Education)," accessed December 17, 2018, https://www.cde.ca.gov/re/es/evidence.asp.

strong theories of action that show promise, though may not have been fully evaluated.

There have been numerous interventions and reforms implemented in schools in an attempt to reduce the achievement gap. Amongst them:

- Extended Learning Opportunities. Research over the past decade points to the potential benefits of providing students with additional opportunities to increase learning and instruction time beyond the traditional school day. The additional opportunities to learn often take different forms, but results indicate more positive results than not.[12]
- Curriculum Mapping. By providing a broad overview of exactly what is going on over an entire school year, curriculum mapping helps schools address gaps in content areas and better align their curricula with state and national standards. School and district leaders identify curriculum mapping as one of the most important components toward improving academic achievement.[13]
- Whole-School Reforms. In a district-wide study of a whole-school reform model – Talent Development Middle Schools – researchers explored how the implementation of a set of instructional, teacher-focused support and school climate reforms influenced achievement in high-poverty schools.[14] Under this model, teachers worked in teams to organize students into small learning communities.[15]

  Students also received an academically rigorous curriculum, with professional development and curriculum coaches provided for the teachers. At the schools participating in the whole-school reform efforts, students significantly closed the achievement gap at a higher rate than did students in the comparison group.[16]

12 A tier 3 evaluation of high quality afterschool programs (i.e., those offering a combination of academic enrichment and recreational activities) found that regular participation in such programs predicted significant gains in math achievement and helped close achievement gaps for struggling learners. Additional research provides evidence that other ways of extending student's learning time, such as lengthening the school day, shows promise as a school-level reform that helps students make up ground on the achievement gap, provided the extra time incorporates productive learning activities. Deborah Lowe Vandell, Elizabeth R Reisner, and Kim M Pierce, "Outcomes Linked to High-Quality Afterschool Programs: Longitudinal Findings from the Study of Promising Afterschool Programs," n.d., 9. Irvine, CA: University of California, Irvine.

13 It is important to note that curriculum mapping is often only one piece of a broader reform effort. In a school in Illinois that undertook curriculum mapping efforts, student proficiency rates improved from 69% to 89% overall, and from 32% proficiency to 80% proficiency among low-income students. It is worth mentioning here, that there were many other initiatives implemented in this school at the same time, but teachers and administrators identified curriculum mapping as one of the most important pieces. In a Delaware school, 96% students in the fifth grade scored at proficient levels after undertaking curriculum mapping exercises. Here, curriculum mapping was the main initiative. While these results are quite promising, there are no existing empirical studies identifying curriculum mapping as a successful intervention. However, based on the theory of action and observed changes in achievement, curriculum mapping fits the Tier 4 standards for evidence-based interventions. "Improving Student Achievement and Closing the Achievement Gap" (Washington DC: Hanover Research, December 2014), https://www.rcoe.us/educational-services/files/2015/12/10c-Hanover_Improving_Student_Achievement_and_Closing_the_Achievement_Gap__12-2014.pdf.

14 Balfanz and Byrnes, "Closing the Mathematics Achievement Gap in High-Poverty Middle Schools."

15 Corinne M Herlihy and James J Kemple, "The Talent Development Middle School Model" (New York: MDRC, 2004).

16 Researchers identified four key areas across school-, teacher-, and student-level factors needed to promote successful growth – high gain classrooms (surrounding students with peers who succeed), attendance, behavior, and effort. Essentially, schools need to provide students with the

- Charter Schools. There is a growing prevalence of charter schools as alternative options to traditional public schools. Results from across the country have been mixed as to whether these schools help to reduce the achievement gap. However, evaluations of some specific charter school organizations indicate that participation in these schools helps to reduce the achievement gap, over time.[17]
- Social-Psychological Interventions. Minority students confront many negative stereotypes about their abilities to succeed in school. Previous work shows that these negatives stereotypes have a very real impact on achievement in a negative way.[18] Using a self-affirmation intervention designed to help seventh-grade students counteract the effects of the negative stereotypes, researchers found that a relatively simple writing exercise provided at the beginning of class helped to reduce the racial achievement gap by about 40% over the course of a semester-long class.[19]

However, while these studies provide evidence that certain interventions or programs can help reduce the achievement gap in mathematics, there is no empirical evidence under any categorization that a particular intervention, school, or reform movement has been able to totally eliminate achievement gap at scale.

Empirical Analysis

As described above, NAEP data indicate that achievement gaps persist in the United States as a whole. It, therefore, strikes us as important to know whether there are schools across the country that successfully close or reduce achievement gaps—and if so, just how many? A finding that there are many hundreds would suggest that we learn from their strategies and scale them. A finding that there are very few, would perhaps suggest that something else is going on – something structural seems to overcome even the most concerted efforts.

opportunity to succeed by giving them effective teachers and surrounding them with positive role models. They also need to provide incentives for students to show up, behave, and try hard. In the schools implementing these multi-dimensional reforms, 77% of students who received each of these supports saw decreases in the achievement gap during middle school. The results from this study fit the requirements for Tier 3 categorization as an evidence-based intervention.

17 Students in KIPP middle schools exhibited sustained improvement over time ranging from 0.15 standard deviations of improvement in year 1 to 0.31 standard deviations of improvement in year 4. The evaluation of KIPP schools by Mathematica met Tier 2 categorization standards. Christina Clark Tuttle et al., *KIPP Middle Schools: Impacts on Achievement and Other Outcomes. Final Report* (Mathematica Policy Research, Inc, 2013), https://eric.ed.gov/?id=ED540912.Inc, 2013

18 Joshua Aronson, Diane M. Quinn, and Steven J. Spencer, "Stereotype Threat and the Academic Underperformance of Minorities and Women," in *Prejudice*, ed. Janet K. Swim and Charles Stangor (San Diego: Academic Press, 1998), 83–103, https://doi.org/10.1016/B978-012679130-3/50039-9.

19 This study met the Tier 1 ESSA categorization by using a randomized control trial. G. L. Cohen, "Reducing the Racial Achievement Gap: A Social-Psychological Intervention," *Science* 313, no. 5791 (September 1, 2006): 1307–10, https://doi.org/10.1126/science.1128317.

We were particularly interested in identifying schools that closed the *mathematics* achievement gap: Considering the sequential nature of mathematics, closing the achievement gap in this subject is more impressive than in a subject in which early struggles might affect later learning to a lesser degree. In addition to narrowing the subject of our search, we also decided to focus on grades 6 through 8, as students entering the earlier grades do not present as large gaps in achievement (although in reference to the income achievement gap, large differences already exist by the time children begin kindergarten). Rather, achievement gaps grow particularly rapidly during the middle years of school, i.e., in 4th grade through 8th grade,[20] and by sixth grade, these gaps are most likely very evident. Therefore, if a school is able to reduce gaps across these middle grades – at a time when gaps tend to be growing –it must be doing something right to help its students.

Complete closure of the achievement gap is a tall task, and therefore we also searched for schools that were able to reduce the achievement gap, at least incrementally, as measured by proficiency on state tests. Finally, we wanted to consider schools that began with high proportions of students well below proficient but effectively moved students up the ladder toward proficiency, regardless of whether or not the students eventually met proficiency levels. This was an important consideration, as looking only at proficiency does not give credit to those schools that help students make significant gains in achievement but do not necessarily reach proficiency levels. Specifically, we asked the following research questions:

1. Has any school consistently eliminated the achievement gap during the middle school years from 6th to 8th grade?
2. Have any schools been able to consistently reduce the achievement gap, as measured by proficiency, for students in middle school?
3. Have any schools been able to both consistently close the achievement gap and simultaneously improve their weakest students' performance in mathematics in middle school?
4. Have any schools shown achievement gap closure across key demographic groups – African American, Hispanic, or low-income?
5. Is there evidence that charter schools have been able to reduce the achievement gap for middle school students more consistently than district schools?

20 Balfanz and Byrnes, "Closing the Mathematics Achievement Gap in High-Poverty Middle Schools."

To summarize: how many schools completely eliminated the achievement gap over time? How many schools were able to consistently reduce the gap to some extent? How many schools both increased proficiency and promoted improvement among their most struggling students, whose improvement might not meeting proficiency standards? For example, perhaps a middle school had a high percentages of students entering the sixth grade scoring at Performance Level 1 (Did not yet meet expectations) on the PARCC assessment; yet by the eighth grade, a majority of these Level 1 students had moved to Performance Level 3 (Approached expectations). While these Level 3 students would not meet proficiency standards, the movement from Level 1 to Level 3 should not be ignored, as it represents substantial improvement (perhaps even more so than moving large percentages of students from Level 3 to Level 4 – a gain of only one level – at which point they would be considered proficient). Next, considering that the achievement gap is most evident across demographic groups, we also wanted determine whether any schools were able to consistently close the gap for specific subgroups of students. Finally, charter schools can approach teaching and learning differently from traditional schools. Do they, therefore, show evidence of achievement gap reduction at higher levels than traditional public schools?

Methodology

Selection of States

We considered three primary factors when selecting the states to include within this study:

- *Meaningful Measure.* We wanted to make sure that we had accurate measures of student learning and that "proficiency" represented a meaningful benchmark. Therefore, we narrowed our search to states that included (1) high-quality state standards; (2) high standards for proficiency; and (3) well-known, validated measures of student learning.
- *Continuity.* In addition, because we wanted to look across multiple cohorts of students, we needed a consistent measure of student learning, that is, states could not have changed their test in the period under review, nor could the definition of proficiency have changed during the years of our analysis. Therefore, because of both reasons highlighted above, we restricted our search to states that administered either the PARCC or SBAC. Further, because PARRC and SBAC were first

administered in the 2014-2015 school year,[21] we restricted our analysis to states that administered these tests for at least three consecutive years in the four-year period between 2014-15 and 2017-18.

- *Data Feasibility.* These are mainly practical considerations. For example, we recognized that not every consortium state had the data available that we needed, for the time period we need, nor could we necessarily include all of the states that met our criteria.

Ultimately, we included seven sites (six states and Washington, D.C.) in our final dataset. We chose only those states that met each of our criteria as identified above. Table A1 in the appendix provides a complete table of states that met the first condition, as well as reasons for their inclusion (or not) into the study.

How did we analyze the data?

In order to understand how students' performance systematically changed from the beginning of middle school to the end, we grouped schools into bins based on the percentage of students who were proficient from one year to another and counted the number of schools in each bin.

For example, Table 1 shows the number of schools at each range of average proficiency among 6th graders, and how that average proficiency changed when the same students reached the end of 8th grade.[22] The percentage of 6th graders who are proficient at each range can be read from the left-hand side of the table. Table 1 shows (in the "Total" column) that there were 71 schools (4%) in which less than 10% of 6th graders were proficient and there were 3 schools (0%) in which more than 90% of 6th graders were proficient in math, for example. These numbers, where possible, are averaged across our two full cohorts—students who began 6th graders in the 2014-2015 or 2015-2016 school year. The change in proficiency from 6th to 8th grade is identified at the top of the table. Table 1 shows (in the "Total" row), for example, that in 1 school (0%) there was a drop of more than 50% proficiency from 6th to 8th grade and in 2 schools (0%) there was a gain of more than 50% proficiency. Aggregate gains and losses over middle school are also distinguished by color—green and red, respectively—and the totals and percentages of each can be read in the final row of the table.

21 Valerie Strauss, "Federally Funded Common Core PARCC Test Going Prime Time in Six States," Washington Post, accessed December 11, 2018, https://www.washingtonpost.com/news/answer-sheet/wp/2014/12/05/federally-funded-common-core-parcc-test-going-prime-time-in-six-states/; The Regents of the University of California, "History of the Smarter Balanced Assessment Consortium," Smarter Balanced Assessment Consortium, accessed December 11, 2018, http://www.smarterbalanced.org/about/history/.

22 The averages are calculated from our two complete cohorts—cohort 1: 6th grade 2014-2015 to 8th grade 2016-2017 and cohort 2: 6th grade 2015-2016 to 8th grade 2017-2018

Table 1: Average 6th-grade proficiency to average 8th-grade proficiency with two full cohorts of students, All States

Starting proficiency	LOSS						GAIN							
	> 50%	40% - 50%	30% - 40%	20% - 30%	10% - 20%	< 10%	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	2	0	0	0	0	0	2	0.00
Less than 10% Proficiency	0	0	0	0	0	21	39	7	4	0	0	0	71	0.04
10% to 20% Proficiency	0	0	0	2	19	55	67	29	9	0	1	0	182	0.11
20% to 30% Proficiency	0	0	0	8	22	92	119	71	15	7	2	1	337	0.20
30% to 40% Proficiency	0	0	0	3	22	87	118	74	19	1	1	1	326	0.20
40% to 50% Proficiency	1	0	3	5	17	68	112	59	6	3	2	0	276	0.17
50% to 60% Proficiency	0	1	0	3	18	61	87	38	18	1	1	0	228	0.14
60% to 70% Proficiency	0	1	0	3	7	34	61	26	2	0	0	0	134	0.08
70% to 80% Proficiency	0	0	0	3	6	20	36	4	2	0	0	0	71	0.04
80% to 90% Proficiency	0	0	0	0	0	9	12	0	0	0	0	0	21	0.01
Above 90% Proficiency	0	0	0	0	0	1	2	0	0	0	0	0	3	0.00
Total	1	2	3	27	111	448	655	308	75	12	7	2	1651	
Percentage	0.00	0.00	0.00	0.02	0.07	0.27	0.40	0.19	0.05	0.01	0.00	0.00		
		592			0.36			1059			0.64			

We address our research questions using the counts in each table. For example, if a school had an average starting proficiency of 60% in 6th grade, and students made average gains of 40% by 8th grade, we would identify this school as closing the achievement gap, on average, over multiple cohorts of students. In addition, the tables highlight schools that might not have fully closed the achievement gap on average, but made strong gains towards reducing the achievement gap—a school with an average starting proficiency of less than 20% in 6th grade that makes an average of 50% gains in proficiency, for example.

Results

Has any school consistently eliminated the achievement gap during the middle school years from 6th to 8th grade? No.

An initial answer to this question is provided in Table 1, which shows the average proficiency from 6th to 8th grade among our two full cohorts. Schools that consistently close the achievement gap will fall within the dark green bins. That is, in order for a school with above-90% proficiency to eliminate the achievement gap, it must have made a less-than-10% positive gain. Note, however, that not all schools within the dark green bins necessarily closed the achievement gap. For example, a school with average proficiency of above

90%—92% in one cohort, for example—would need to improve proficiency among this class by 8% in order to eliminate the proficiency gap. However, a school that improved its students' proficiency by 2% would also be counted within the dark green bin, even though the school did not quite eliminate the achievement gap.

Indeed, closer examination of the five schools within the dark green bins, presented in Table 2, shows that no school eliminated the achievement gap. Note that while one school achieved 100% proficiency in the 8th grade, the school did not alter the achievement gap, but *maintained* students' high proficiency levels.

Table 2: Percentage of students proficient in schools near closing the achievement gap, All States

		Cohort 1			Cohort 2		
School #	State	6th Grade	7th Grade	8th Grade	6th Grade	7th Grade	8th Grade
28580	NH	87	89	91	94	92	93
4010310	NJ	100	100	100	97	92	*
80010	NJ	67	72	96	82	71	*
3020010	NJ	68	76	88	80	79	*
346	OR	33.3	75	80	73.3	57.9	*

Table 2 also highlights the value of looking at both beginning and ending middle school proficiency. Even if several schools had successfully reached 100% proficiency, that achievement means very little if the student body averaged more than 95% proficient in 6th grade since there was little achievement gap to begin with. In contrast, the schools that made large gains, such as the New Jersey school that started with 67% proficiency among 6th graders, and increased proficiency to 96% by 8th grade has surely made more impressive progress. Even more impressive is the Oregon school that increased proficiency from 33% in 6th grade to 80% in 8th grade.[23]

Indeed, Table 1 shows not only which schools made impressive gains towards reducing achievement gaps, but perspective on how impressive these gap closures are. For example, Table 1 shows that of the 1,651 schools with sufficient data, nearly 70% remained within 10 percentage points (above or

23 Although the plausibility of these statistics might be questioned by some and perhaps poses a good example of the data limitations we discuss at the end of the paper

below) of their 6th-grade proficiency by 8th grade. Further, over 90% of schools stayed within 20 percentage points (of their 6th-grade proficiency) by 8th grade. Therefore, the 21 schools that were able to make proficiency gains of 30 percentage points—or more—from 6th to 8th grade, are particularly impressive.

Table 1, therefore, provides evidence that some schools are able to make impressive gains towards closing the achievement gap, but does not provide information about whether these gap closures are consistent beyond the two cohorts represented in the table. Given data constraints, we address this question by restricting our search for schools with consistent achievement gap reductions to (1) schools that made positive changes from 6th to 8th grade among our two full cohorts of students and (2) also made positive gains every year for any partial cohorts for which we have information. These results are shown in Table 3, and address our second research question:

Have any schools been able to consistently reduce the achievement gap, as measured by proficiency, for students in middle school?

Yes, 144 schools (about 9% of all schools) have done so.

Table 3: Average 6th grade proficiency to average 8th grade proficiency with two full cohorts of students, among schools that showed positive proficiency improvement in every year, All States.

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	7	2	2	0	0	0	11	0.08
10% to 20% Proficiency	12	11	5	0	0	0	28	0.19
20% to 30% Proficiency	7	14	1	3	2	0	27	0.19
30% to 40% Proficiency	5	12	5	0	1	0	23	0.16
40% to 50% Proficiency	4	8	2	2	1	0	17	0.12
50% to 60% Proficiency	3	9	9	0	0	0	21	0.15
60% to 70% Proficiency	3	8	0	0	0	0	11	0.08
70% to 80% Proficiency	5	0	0	0	0	0	5	0.03
80% to 90% Proficiency	1	0	0	0	0	0	1	0.01
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	47	64	24	5	4	0	144	
	0.33	0.44	0.17	0.03	0.03	0.00		

Table 3 shows that 144 schools (out of the original 1,651 schools with sufficient data)—approximately 9% of all schools—were able to increase students' proficiency levels in middle school math every year from the 2014-2015 school year to the 2017-2018 school year. Among these schools, the proficiency level in more than three-quarters of them (77% of the 144 schools) remained within 20 percentage points between 6th to 8th grade (among our two full cohorts of students). However, nine schools made large gains: an increase in proficiency between 30 and 50 percentage points over the two years from 6th to 8th grade. Therefore, of the 21 schools that made the most outsized gains in Table 1, almost half (42%) were able to make consistent, positive gains across each group of students from 2014 to 2018. Further, two of these schools started with less than 1/3 of their students proficient in math in 6th grade, and were able to increase proficiency by an average of 40 to 50 percentage points over two years.

Table 3, therefore, provides evidence that some schools are able to make consistent and large gains towards closing the achievement gap. However, while the table provides evidence that large, consistent achievement-gap reduction is possible, it is rare: less than 10% of the schools (with sufficient data) are able to consistently reduce the achievement gap, and less than 1% are able to increase proficiency by 30 percentage points or more.

A further consideration of gap reduction is how the weakest students—those with the most room to improve in order to reach proficiency—fare as the rest of the school moves towards proficiency. The previous tables provide no information about the improved learning of students who have not yet reached proficiency. In order to address this question, we added an additional constraint to those used in Table 3: schools must show not only increased proficiency levels every year, but a decrease in the percentage of level 1 students every year. The counts for these schools are shown in Table 4, and address the following research question:

Have any schools been able to both consistently close the achievement gap and simultaneously improve their weakest students' performance in mathematics in middle school?

Yes, 10 schools did so, which is less than 1% of the sample.

Table 4: Average 6th-grade proficiency to average 8th-grade proficiency with two full cohorts of students, among schools that showed positive proficiency improvement and a decrease in the percentage of level 1 students in every year, All States

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	0	0	0	0	0	0	0	0.00
10% to 20% Proficiency	2	4	1	0	0	0	7	0.70
20% to 30% Proficiency	0	0	0	0	0	0	0	0.00
30% to 40% Proficiency	0	1	0	0	0	0	1	0.10
40% to 50% Proficiency	0	0	0	0	0	0	0	0.00
50% to 60% Proficiency	0	0	1	0	0	0	1	0.10
60% to 70% Proficiency	0	0	0	0	0	0	0	0.00
70% to 80% Proficiency	1	0	0	0	0	0	1	0.10
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	3	5	2	0	0	0	10	
	0.30	0.50	0.20	0.00	0.00	0.00		

Table 4 shows that, out of the 1,651 schools in our sample, 10 schools (less than 1%) were able to achieve both consistent improvement (in terms of the percentage of students who meet mathematics proficiency every year) and a consistent decrease in the percentage of students who score a level 1 on their mathematics test. Perhaps even more interesting than this expectedly modest number is the fact that none of the schools that showed the largest gains from 6th to 8th grade were also able to improve the learning of their weakest students. Rather, the schools that were able to both increase proficiency and also improve learning among their most struggling students—every year—were schools that showed more modest gains in proficiency—up to a 30-percentage point increase. This suggests that schools might face a trade-off when determining whether to focus on helping their weakest students or those students most likely to reach proficiency.

Further, note that seven of the 10 schools started with relatively low proficiency levels in 6th grade - between 10% and 20%. It is surprising that schools with such a relatively academically weak student body would make such consistent gains to students' learning, especially as only 15% of the entire sample of schools started with 20% or less of their 6th graders proficient. In contrast, only one of the schools that made such consistently strong gains started with relatively high proficiency rates of 70-80% in 6th grade.

In addition to investigating how many schools were able to support the learning of their academically weakest students, we also considered how many schools were able to consistently improve the proficiency of more vulnerable student subgroups. We next, therefore, address the following research question:

Have any schools shown achievement gap closure across key demographic groups – African American, Hispanic, or low-income?

Yes, 22, 41, and 66 schools showed consistent gap closure amongst African American, Hispanic, and low-income students, respectively.

In order to look at schools' consistent success among student subgroups, we take the same constraints as Table 3—that is, looking at schools that increased proficiency levels among our two full cohorts and in every year with students from 2014-2018—and restricted these gains to each student subgroup. These counts, shown in Table 5, for African American, Hispanic, and low-income students in panels A, B, and C, respectively.

One important caveat to keep in mind when interpreting these counts is that not every state or school will have as much information about student subgroups as they do for the school's entire student body. Therefore, the 22 schools that showed improvement for every group of African American students from 2014-2015 school year to the 2017-2018 actually represents 9% of the schools that have sufficient data to track the progress of the two cohorts. Similarly, the 41 schools that show consistent gap closing amongst Hispanic students and the 66 schools that show consistent improvement among low-income students represent 9% and 7% of the schools with sufficient data about these groups of students, respectively.

Note that most of the same patterns observed in the earlier tables hold true in Table 5. For example, Table 4 showed that the majority of the schools that made consistent gains in terms of both proficiency and a decrease in the percentage of level 1 scores started with very low initial levels of proficiency. We observe the same pattern in Table 5. The majority of schools that improved proficiency levels among student subgroups started with low initial levels of proficiency—the distribution of 6th grade proficiency is clustered around 10-40% proficiency in 6th grade. Further, Table 5 shows that no schools that made consistent proficiency gains amongst their subgroups started with relatively

high initial proficiency levels in 6th grade. None of the subgroups started with more than 70% proficiency in 6th grade in any of these successful schools.

Table 5: Average 6th-grade proficiency to average 8th-grade proficiency with two full cohorts of students, among schools that showed positive proficiency improvement in every year, All States

Panel A: African American Students

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	1	1	1	0	0	0	3	0.14
10% to 20% Proficiency	5	4	2	1	0	0	12	0.55
20% to 30% Proficiency	1	2	2	0	0	0	5	0.23
30% to 40% Proficiency	0	0	0	0	0	0	0	0.00
40% to 50% Proficiency	0	0	0	0	0	0	0	0.00
50% to 60% Proficiency	0	2	0	0	0	0	2	0.09
60% to 70% Proficiency	0	0	0	0	0	0	0	0.00
70% to 80% Proficiency	0	0	0	0	0	0	0	0.00
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	7	9	5	1	0	0	22	
	0.32	0.41	0.23	0.05	0.00	0.00		

Panel B: Hispanic Students

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	2	0	0	1	0	0	3	0.07
10% to 20% Proficiency	5	9	0	0	0	0	14	0.34
20% to 30% Proficiency	0	4	6	1	0	0	11	0.27
30% to 40% Proficiency	1	3	0	1	0	0	5	0.12
40% to 50% Proficiency	0	2	1	1	0	0	4	0.10
50% to 60% Proficiency	0	0	2	1	0	0	3	0.07
60% to 70% Proficiency	0	0	1	0	0	0	1	0.02
70% to 80% Proficiency	0	0	0	0	0	0	0	0.00
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	8	18	10	5	0	0	41	
	0.20	0.44	0.24	0.12	0.00	0.00		

Panel C: Low-Income Students

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	4	3	0	0	0	0	7	0.11
10% to 20% Proficiency	8	12	3	1	0	0	24	0.36
20% to 30% Proficiency	5	10	4	1	0	1	21	0.32
30% to 40% Proficiency	2	4	2	2	0	0	10	0.15
40% to 50% Proficiency	1	1	0	0	0	0	2	0.03
50% to 60% Proficiency	0	1	1	0	0	0	2	0.03
60% to 70% Proficiency	0	0	0	0	0	0	0	0.00
70% to 80% Proficiency	0	0	0	0	0	0	0	0.00
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	20	31	10	4	0	1	66	
	0.30	0.47	0.15	0.06	0.00	0.02		

Both Tables 4 and 5 also show that most schools that make consistent improvement, also make modest progress towards achievement gap closing. This suggests, therefore, that most of the schools that have shown success year after year are very far from closing the achievement gap among disadvantaged student subgroups. Nonetheless, in contrast Table 4, there are several schools that made large increases in proficiency from 6th to 8th grade. For example, panel C shows that one school saw an increase of more than 50 percentage points from 6th to 8th grade among students from poorer backgrounds, and another four schools showed gains of 30 to 40 percentage points. These gains show that, while large increases in proficiency among student subgroups are possible, they are extremely rare.

Given the rarity of achievement gap reductions across all schools, we wondered whether charter schools have shown substantially better progress towards gap closing than traditional public schools. Unfortunately, while test scores from charter schools are included within the publicly available data analyzed in this report, New Jersey is the only state that explicitly identified their charter schools.[24] Therefore, we confine our analysis of charter schools to New Jersey to answer the following research question:

24 Note that some charter schools are easy to identify because the word "charter" is included in the school's name. However, in order to calculate an accurate count of charter schools with sufficient data to be included in the report, we need an accurate count of all charter schools in the data.

Is there evidence that charter schools have been able to show a more consistent reduction in the achievement gap for middle school students?

The evidence is not compelling: 10% of traditional schools (49 schools) compared with 16% of charter schools (seven schools) in New Jersey consistently reduced the achievement gap.

In order to address this question, we revisited our analysis in Table 3, but confined to schools within New Jersey. That is, we count how many middle schools in New Jersey show a positive increase in the percentage of proficient students from 6th grade to 8th grade in our two full cohorts.[25] In addition, these schools were also required to show an increase in the percentage of proficient students from one year to the next, within the same cohort, across all of the schools' available data from 2014-2018.

The counts from this analysis are presented in Table 6, where the top row of statistics provides total school counts, the second row shows the counts of schools that meet the criteria of consistent growth, and the bottom row converts the school counts into percentage of schools that met the consistent growth criteria. Table 6, therefore, shows that there is a higher percentage of charter schools in New Jersey that show consistent growth in middle school mathematics. However, while 16% of charter schools is a larger percentage than the 10% of traditional public schools that show consistent growth, this still represents a small percentage (and small observed number) of the charter schools that serve middle school students.

Table 6: Percentage of schools with consistent growth in New Jersey

	Traditional Public Schools	Charter Schools	Total Count
Count: Schools with Data	488	43	531
Count: Schools with Consistent Growth	49	7	56
Percentages: Schools with Consistent Growth	0.10	0.16	0.11

25 Cohort 1 are 6th graders in 2014-2015 and 8th grade in 2016-2017. Cohort 2 is comprised of 6th graders in 2015-2016 to 8th graders in the 2017-2018.

The growth in proficiency of the New Jersey schools that meet the criterion, described above, are shown in Table 7. In addition, Table 7 identifies traditional public schools, in panel A, and charter schools, in panel B, that consistently reduce the achievement gap.

Table 7 provides evidence that a larger proportion of charter schools show more improvement than traditional public schools in consistently reducing the achievement gap in New Jersey. For example, among the consistently successful charter schools, 28% (2 schools) made gains of 30 percentage points or more, compared to 8% (four schools) of traditional public schools. Nonetheless, the patterns in gains are relatively similar between consistently successful charter and traditional public schools.

In addition, Table 7 confirms the findings from Table 1: no school— charter or traditional public—closed the achievement gap completely. Therefore, while charter schools may perform relatively better than traditional public schools in terms of consistent gap reduction, the differences between the two kinds of schools, at least in New Jersey, are not substantively different. Thus, our analysis of charter schools reaches the same conclusions as the rest of the analysis: consistent gap reduction is possible, but very rare.

Table 7: Average 6th grade proficiency to average 8th grade proficiency with two full cohorts of students, among schools that showed positive proficiency improvement in every year, New Jersey

Panel A: Traditional Public Schools

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	1	0	0	0	0	0	1	0.02
10% to 20% Proficiency	3	3	1	0	0	0	7	0.14
20% to 30% Proficiency	0	4	1	2	0	0	7	0.14
30% to 40% Proficiency	1	1	2	0	1	0	5	0.10
40% to 50% Proficiency	4	3	0	0	1	0	8	0.16
50% to 60% Proficiency	2	5	8	0	0	0	15	0.31
60% to 70% Proficiency	0	5	0	0	0	0	5	0.10
70% to 80% Proficiency	1	0	0	0	0	0	1	0.02
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	12	21	12	2	2	0	49	
	0.24	0.43	0.24	0.04	0.04	0.00		

Panel B: Charter Schools

Starting proficiency	GAIN							
	< 10%	10% - 20%	20% - 30%	30% - 40%	40% - 50%	>50%	Total	Percentage
0% Proficiency	0	0	0	0	0	0	0	0.00
Less than 10% Proficiency	0	0	0	0	0	0	0	0.00
10% to 20% Proficiency	1	1	2	0	0	0	4	0.57
20% to 30% Proficiency	0	0	0	0	1	0	1	0.14
30% to 40% Proficiency	0	0	0	0	0	0	0	0.00
40% to 50% Proficiency	0	0	0	1	0	0	1	0.14
50% to 60% Proficiency	0	1	0	0	0	0	1	0.14
60% to 70% Proficiency	0	0	0	0	0	0	0	0.00
70% to 80% Proficiency	0	0	0	0	0	0	0	0.00
80% to 90% Proficiency	0	0	0	0	0	0	0	0.00
Above 90% Proficiency	0	0	0	0	0	0	0	0.00
Total	1	2	2	1	1	0	7	
	0.14	0.29	0.29	0.14	0.14	0.00		

Implications

The results of our search through the data from six states and the District of Columbia presented some interesting findings. To summarize:

- No school eliminated the math achievement gap during the middle school years from 6th to 8th grade between 2014 and 2018.
- Approximately 9%, or 144 schools, in our sample, were able to *consistently reduce* the achievement gap, as measured by proficiency, for students in middle school.
- Fewer than 1%, or 10 schools, were able to consistently close the achievement gap and also increase their weakest students' understanding in middle school math.
- Approximately 9% (22 schools), 9% (41 schools), and 7% (66 schools) of schools consistently closed the achievement gap across key demographic groups – African American, Hispanic, or low-income students, respectively.
- Around 16% of New Jersey charter schools (7 schools), compared with 10% of New Jersey traditional public schools (49 schools) were able to *consistently reduce t*he achievement gap, as measured by proficiency, for students in middle school.

These findings further suggest a number of implications worth considering.

First, *while it may be possible to eliminate the achievement gap in middle school math, we have not found any evidence suggesting any school has been able to successfully do so.* We therefore wonder if, under current educational conditions, eliminating the achievement gap is a realistic or meaningful goal for schools and districts.

A second implication stems from the rarity of consistent gap reduction. We found that, while very few schools consistently reduce the achievement gap—especially substantially (e.g. by more than 30 percentage points from 6th to 8th grades)—such gap reductions are indeed possible, even within schools that start with very low initial levels of proficiency in 6th grade. *However, consistent and modest gains (e.g. around 10 percentage points) are also very rare. Instead, we find that most schools make modest changes to students' proficiency levels year upon year, but that it is very rare for these changes to remain consistently positive.* We find that this hold true both for traditional public schools, as well as charter schools.

A third implication focuses on the ability of schools to help those students who

are the furthest behind. We found evidence showing it is *possible* for schools to consistently reduce the overall achievement gap while simultaneously improving the performance of the weakest students. This was, however, very rare: *fewer than 1% of the schools in our sample were able to both consistently improve proficiency while also improve learning for students who were furthest behind.*

Finally, our findings help to highlight the continued importance of focusing on achievement gap closure for specific subgroups of students. As noted, those schools showing consistent improvement for different subgroups of students tended to exhibit relatively low initial 6th-grade proficiency rates for these groups compared to the full group of schools. With this in mind, schools need to be particularly diligent in working with these groups to not only help them reach proficiency, but also to make progress up the ladder toward proficiency. Our analysis shows that this goal is achievable, even when very few entering 6th graders are proficient.

As previous researchers have questioned—and these results further highlight—perhaps overall proficiency is not the best way to measure a school's impact on student learning and performance, but instead the focus should be on the improvement of all students, regardless of their abilities upon entering the school. The finding that so few schools are able to both improve proficiency rates and simultaneously decrease the proportion of level 1 students points to the idea that there should be multiple measures of measuring success for a school. Our analysis opens up the question of the relationship between improving student learning outcomes and how we measure that learning. Focusing on growth as well as proficiency, as ESSA enables us to do, is surely a step forward from measuring proficiency alone, since the latter occludes real learning progress. But the current assessments—and our measurement of the growth in performance of those assessments—focus on the achievement required at a given grade level. With so many students entering that grade far below readiness to learn material at grade level, measuring their learning only by that standard might also be counter-productive.

There are two final points of consideration. First, does the current form of assessment incentivize schools to teach the appropriate skills and at the appropriate level for their students, or do the current measures of student achievement unwittingly work to increase the achievement gap? Second, with a vast majority of schools neither reducing nor growing their achievement gap more

than a small amount, do these assessments serve as the appropriate measure of student ability? Can we do better?

Limitations and Future Research

There are a few limitations to the work done here. The data-reporting procedures are the primary limitation to consider in this work. Specifically, we rely on states to consistently and accurately report school-level data.

Failure of the consistency assumption—that is, consistently reported data—leads to a smaller analysis. For example, we were only able to analyze 1,651 schools out of the total 3,765 middle schools in the seven sites included in the analysis, or approximately 44%. Further, if some schools were systematically under-reported (such as schools in poorer areas), then our results would not be representative of all of the schools in our seven sites. However, we believe that it is unlikely that schools with great success in closing achievement gaps—i.e. the schools that we are trying to identify—would fail to report their great successes. Thus, because this analysis focuses more on identifying schools that successfully close or reduce the achievement gap, as opposed to identifying greater gap-closing trends, we believe the primary result of this first limitation is a reduced sample size.

Failure of the accuracy assumption, however, is a potentially more serious concern. Unfortunately, we have very little information about the accuracy of the reported data. We suspect that there is inaccurate data reported, as some annual gains appear to be suspiciously high. One way we are able to address this limitation is by averaging results across multiple years, which would lessen any one-time inaccurate data reports. Further, we suspect that data inaccuracies are more likely to exaggerate gains, rather than to under-report actual gains. If this is true, then these findings can be interpreted as an estimate of the upper bound of the number of successful schools in the seven sites.

This research shows that it is very difficult to manage consistent – both year-after-year and cohort-after-cohort – improvement in student performance. To further understand this pattern, it would be helpful to continue looking at schools in the future (as additional years of test data are added). Tracking more student cohorts would provide further evidence about the ability of schools to consistently reduce (or close) the achievement gap. In additional, further conclusions might be drawn by also loosening some of the requirements for

inclusion in the study and looking at states that do not use PARCC

or SBAC. Expanding the sample would certainly improve the generalizability of findings.

Finally, one intriguing area of further research would be a closer examination of schools that make particularly admirable improvements in consistently reducing the achievement gap. Such an investigation would help identify commonalities across successful schools and determine whether these factors are replicable in other sites. Continuing to observe and monitor the mathematics achievement gap in schools around the country is necessary if we as a nation want to continue to combat it.

About

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Appendix

Appendix Table A: Possible States for Sample[1]			
State	**Test**	**Years for included States**	**Notes**
California	SBAC	N/A	No grade-specific data
Colorado	PARCC	2014-2017	Included in study
Connecticut	SBAC	N/A	Inaccessible data
Delaware	SBAC	N/A	No breakdown by percent at each level
District of Columbia	PARCC	2014-2018	Included in study
Hawaii	SBAC	N/A	No breakdown by percent at each level
Idaho	SBAC	2014-2018	Not included
Illinois	PARCC	N/A	No sub-group data readily available
Louisiana	PARCC (mixed with State Assessment)	N/A	Changed from PARCC to mix, therefore not a consistent standard
Maryland	PARCC	N/A	No sub-group data readily available
Massachusetts	PARCC (mixed with State Assessment)	N/A	Changed from PARCC to mix, therefore not a consistent standard
Michigan	SBAC (mixed with State Assessment)	N/A	Changed from SBAC to mix, therefore not a consistent standard
Montana	SBAC	N/A	Inaccessible data
Nevada	SBAC	N/A	Inaccessible data
New Hampshire	SBAC and performance assessments	2014-2018	Included in study
New Jersey	PARCC	2014-2017	Included in study
New Mexico	PARCC	N/A	No sub-group data readily available
North Dakota	SBAC	N/A	Inaccessible data
Oregon	SBAC	2015-2018	Included in study
Rhode Island	PARCC	N/A	Inaccessible data
South Dakota	SBAC	N/A	Inaccessible data
Vermont	SBAC	2014-2017	Included in study
Washington	SBAC	2014-2018	Included in study
West Virginia	SBAC	N/A	Inaccessible data

26 "Which States Are Using PARCC or Smarter Balanced? - Education Week," Education Week, February 15, 2017, https://www.edweek.org/ew/section/multimedia/states-using-parcc-or-smarter-balanced.html.

Appendix Table B: State-Level Sample Sizes								
	Vermont	Oregon	Washington	New Hampshire	DC	Colorado	New Jersey	Total
Years	2014-2017	2014-2017	2014-2018	2014-2018	2014-2018	2013-2017	2014-2017	
Total number of schools	232	591	845	196	89	839	973	3765
Schools with 6th and 8th grade data: cohort 1, All Students	73	302	293	115	47	24	531	1605
Schools with 6th and 8th grade data: cohort 1, African American Students	0	0	145	9	9	72	184	419
Schools with 6th and 8th grade data: cohort 1, Hispanic Students	30	238	215	68	42	83	283	959
Schools with 6th and 8th grade data: cohort 1, low-SES students	0	0	5	97	56	0	0	438
Schools with 6th and 8th grade data: cohort 2	0	0	40	0	43	0	0	83
Schools with 6th and 8th grade data: cohort 2, African American Students	0	0	144	3	8	0	0	155
Schools with 6th and 8th grade data: cohort 2, Hispanic Students	0	0	218	20	0	0	0	238
Schools with 6th and 8th grade data: cohort 2, low-SES students	232	591	845	196	89	839	973	3765